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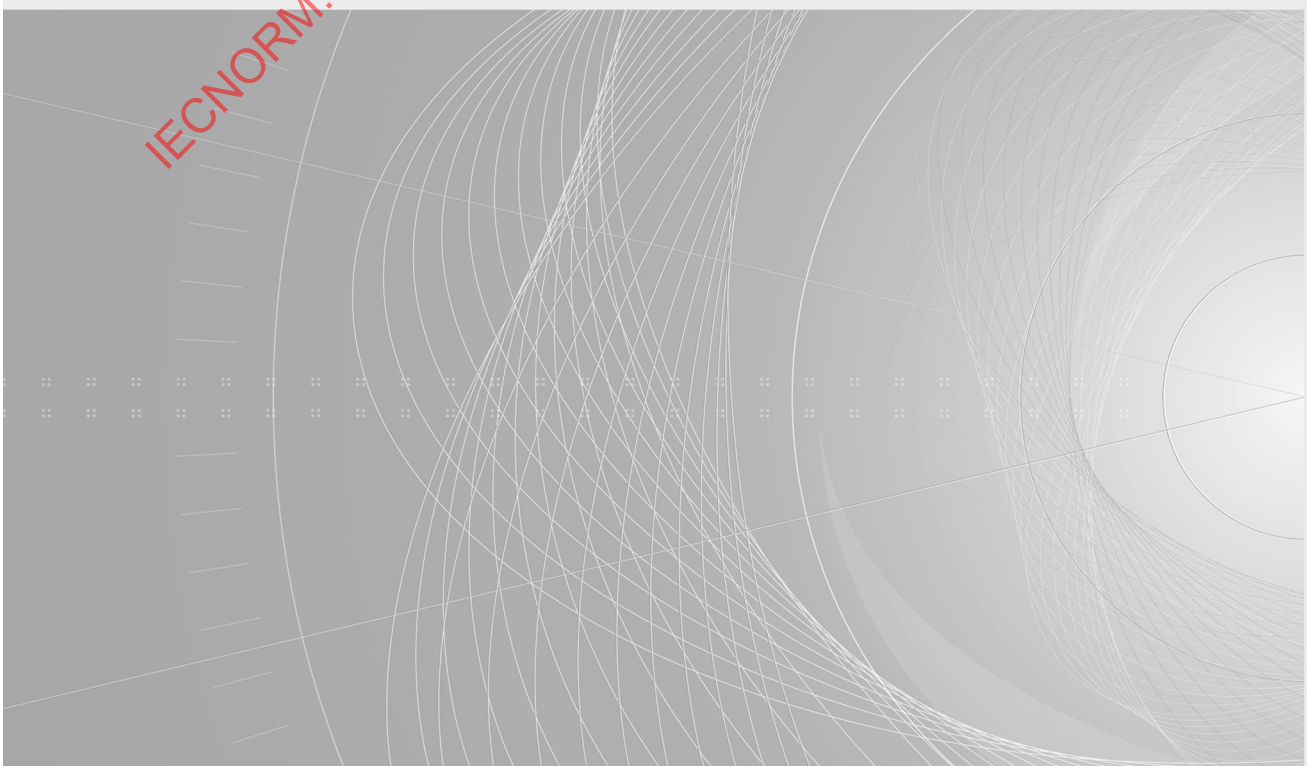
Edition 3.0 2015-04

INTERNATIONAL STANDARD

Automatic electrical controls –
Part 2-12: Particular requirements for electrically operated door locks



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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AUTOMATIC ELECTRICAL CONTROLS –

Part 2-12: Particular requirements for electrically operated door locks

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60730-2-12 has been prepared by technical committee 72: Automatic electrical controls.

This third edition cancels and replaces the second edition published in 2005. This edition constitutes a technical revision. This edition includes the following significant technical changes with respect to the previous edition:

a) aligns the text with IEC 60730-1, Edition 5;
b) modifies requirements for Class B control function (H.27.1.2.2);
c) modifies requirements for Class C control function (H.27.1.2.3);
d) modifies requirements for faults during safety shut-down.

The text of this standard is based on the following documents:

FDIS	Report on voting
72/981/FDIS	72/993/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This part 2 is intended to be used in conjunction with IEC 60730-1. It was established on the basis of the fifth edition (2013) of that publication. Consideration may be given to future editions of, or amendments to, IEC 60730-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60730-1 so as to convert that publication into the IEC standard: Particular requirements for electrically operated door locks.

Where this part 2 states "addition", "modification", or "replacement", the relevant requirement, test specification or explanatory matter in part 1 should be adapted accordingly.

Where no change is necessary, this part 2 indicates that the relevant clause or subclause applies.

In the development of a fully international standard, it has been necessary to take into consideration the differing requirements resulting from practical experience in various parts of the world and to recognize the variation in national electrical systems and wiring rules.

The “in some countries” notes regarding differing national practices are contained in the following subclauses:

17.1.3.1

17.7.1

17.7.7

17.10.4

27.2.3.1

In this publication:

1) The following print types are used:
   - Requirements proper: in roman type;
   - *Test specifications: in italic type;*
   - Notes; in small roman type;
   - Words defined in Clause 2: **bold**.
2) Subclauses, notes, tables and figures which are additional to those in part 1 are numbered starting from 101; additional annexes are lettered AA, BB, etc.

A list of all parts of the IEC 60730 series, published under the title *Automatic electrical controls* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

AUTOMATIC ELECTRICAL CONTROLS –

Part 2-12: Particular requirements for electrically operated door locks

1 Scope and normative references

This clause of Part 1 is applicable except as follows:

1.1 Scope

Replacement:

This part of IEC 60730 applies to **electrically operated door locks** for use in, on or in association with equipment, including equipment for heating, air-conditioning and similar applications. The equipment may use electricity, gas, oil, solid fuel, solar thermal energy, etc., or a combination thereof.

NOTE 1 Throughout this standard, the word "equipment" includes "appliance" and "control system".

This standard also applies to **electrically operated door locks** for equipment that may be used by the public, such as equipment intended to be used in shops, offices, hospitals, farms and commercial and industrial applications.

This standard does not apply to **electrically operated door locks** intended exclusively for industrial process applications unless explicitly mentioned in the equipment standard.

This standard does not apply to **electrically operated door locks** intended for security access applications.

NOTE 2 Standards that cover these applications are under IEC Technical Committee 79.

1.1.1 *Replacement:*

This standard applies to the inherent safety, to the **operating values**, **operating sequences** where such are associated with equipment protection, and to the testing of door locks used in, or in association with equipment.

This standard is also applicable to door locks for appliances within the scope of IEC 60335-1.

NOTE Throughout this standard, the word “door” means “door, cover or lid”. The words “door lock” mean “electrically operated door lock”.

This standard is also applicable to individual door locks utilized as part of a **control system** or door locks which are mechanically integral with multi-functional **controls** having non-electrical outputs or employing motors.

Door locks for equipment not intended for normal household use, but which nevertheless may be used by the public, such as equipment intended to be used by laymen in shops, in light industry and on farms, are within the scope of this standard.

This standard is also applicable to the **functional safety** of **low complexity safety related systems** and **controls** employing door locks as the actuating element.

1.1.2 *Replacement:*

This standard applies to door locks with electrical circuits and **control** circuits which are, for example, operated by bimetals, magnet coils, memory metals, pressure elements, temperature-sensitive expansion elements or electronic elements.

1.1.3 Not applicable.

1.1.4 *Replacement:*

This standard applies to **manual controls** when such are electrically and/or mechanically integral with door locks.

NOTE Requirements for manual switches not forming part of a door lock are contained in IEC 61058-1.

1.1.5 *Replacement:*

This standard applies to a.c. or d.c. powered door locks with a rated voltage not exceeding 690 V a.c. or 600 V d.c.

1.1.6 *Replacement:*

This standard does not take into account the **response value** of an **automatic action** of a door lock, if such a **response value** is dependent upon the method of mounting the **control** in the equipment. Where a **response value** is of significant purpose for the protection of the **user**, or surroundings, the value defined in the appropriate equipment standard or as determined by the manufacturer shall apply.

1.1.7 *Replacement:*

This standard applies also to door locks incorporating **electronic devices**, requirements for which are contained in Annex H and door locks using **thermistors**, requirements for which are contained in Annex J.

2 Terms and definitions

This clause of Part 1 is applicable except as follows:

2.2 Definitions of types of control according to purpose

Additional definition:

2.2.101
electrically operated door lock
incorporated or integrated **electrically operated mechanism** intended to control the door **locking** in equipment by means of a mechanical output mechanism which physically secures a door, **cover** or lid

2.3 Definitions relating to the function of controls

Additional definitions:

2.3.101
drop-out value
operating value at which the **locking** means is disengaged

2.3.102
locking
mechanical action intended to block a door mechanism in such a way that opening of the door is prevented under defined conditions

2.3.103
locking delay
period of time elapsing between the signal to lock and completion of the **locking** action

2.3.104
locking force
minimum mechanical force intended for the door lock to prevent opening of the door

2.3.105
locking security
condition in which the door lock either prevents an appliance door from being opened or prevents the appliance from being operated, even if the door lock is damaged

2.3.106
unlocking delay
period of time elapsing between the signal to unlock and completion of the unlocking action

3 General requirements

This clause of Part 1 is applicable.

4 General notes on tests

This clause of Part 1 is applicable except as follows:

4.1 Conditions of test

4.1.1 *Addition:*

NOTE 101 An actual door or a suitable device simulating the door may be used for the tests of this standard.

5 Rating

This clause of Part 1 is applicable.

6 Classification

This clause of Part 1 is applicable except as follows:

6.3 According to their purpose

Additional subclauses:

6.3.101 – door locks;

6.3.101.1 – voltage sensing;

NOTE The design may include a voltage-sensitive heating element, a magnet coil or an electronic element.

6.3.101.2 – current sensing;

NOTE The design may include a current-sensitive heating element, a magnet coil or an electronic element.

6.3.101.3 – thermally operated;

NOTE **Locking** may be controlled either directly or indirectly by a temperature-sensitive element.

6.3.101.4 – pressure operated.

NOTE Latching may either be directly or indirectly controlled by pressure-sensitive elements.

6.4 According to features of automatic action

Additional subclause:

6.4.101 – **locking security** (Type 1.AA or 2.AA).

7 Information

This clause of Part 1 is applicable except as follows:

7.2 Methods of providing information

Table 1 (7.2 of edition 3) – Required information and methods of providing information

Addition:

	Information	Clause or subclause	Method
101	**Locking delay**[101]	2.3.103	X
102	**Unlocking delay**[101]	2.3.106	X
103	**Locking force** (if declared) [101]	2.3.104 18.101.1	X
104	**Drop-out value**	2.3.101	X
105	Effects on controlled outputs (if declared)[102]	6.4.101 18.101.2	X
106	Method of **operation** for the test of Clause 17	17	X

Addition to Note 1:

For door locks, limits of **activating quantity** are specified either in the applicable appliance standard, by the appliance manufacturer or as declared by the door lock manufacturer (see 17.7 and 17.8).

Additional notes:

[101] These are specified either in the applicable appliance standard, by the appliance manufacturer or by the door lock manufacturer.

[102] This provides for manufacturer declaration of the outputs which will result after **failure** of the door lock.

8 Protection against electric shock

This clause of Part 1 is applicable.

9 Provision for protective earthing

This clause of Part 1 is applicable.

10 Terminals and terminations

This clause of Part 1 is applicable.

11 Constructional requirements

This clause of Part 1 is applicable.

12 Moisture and dust resistance

This clause of Part 1 is applicable.

13 Electric strength and insulation resistance

This clause of Part 1 is applicable.

14 Heating

This clause of Part 1 is applicable.

15 Manufacturing deviation and drift

This clause of Part 1 is applicable.

16 Environmental stress

This clause of Part 1 is applicable.

17 Endurance

This clause of Part 1 is applicable except as follows:

17.1.3 Test sequence and conditions

Replacement:

17.1.3.1 *In general, the sequence of tests is:*

– *an ageing test specified in 17.6 (this test applies only to those actions classified as Type 1.M or 2.M);*

– *an over-voltage test of **automatic action** at accelerated rate specified in 17.7 (in Canada and the USA this test is replaced by the overload test);*

– *a test of **automatic action** at acceleration rate specified in 17.8;*

– *an over-voltage test of **manual action** at accelerated speed specified in 17.10 (in Canada and the USA, this test is replaced by an overload test);*

– *a test of **manual action** as specified in 17.11.*

17.3 Thermal conditions for the tests

Replacement:

17.3.1 *The following thermal conditions apply to door locks:*

– *those parts which are accessible when the door lock is mounted in a declared manner shall be exposed to normal room temperature;*

– *the mounting surface of the door lock shall be maintained between $T_{s\ max}$ and $T_{s\ max}$ +5 °C, or 1,05 times $T_{s\ max}$, whichever is greater;*

– *if the **control** does not cycle with a mounting surface temperature of $T_{s\ max}$, then the test is conducted at (20 ± 5) °C.*

17.3.2 Not applicable.

17.4 Manual and mechanical conditions for the tests

17.4.1 *Replacement:*

*Manual **actuation** shall simulate **operation** of the door. Each operating cycle shall consist of one closing and opening action of the door.*

17.4.2 *Replacement:*

The speed of movement of the simulated door latch for the test shall be:

– *(9 to 45) °/s for rotary actions;*

– *(5 to 25) mm/s for linear actions.*

17.4.3 to 17.4.5 Not applicable.

17.7 Overvoltage (or overload test in Canada, the USA, and all countries using an overload test) of automatic action at accelerated rate

Replace the existing title with the following new title:

17.7 Overvoltage (or, in Canada and the USA, overload) test of automatic action at accelerated rate

17.7.1 *Replacement:*

*The electrical conditions for automatically operated circuits, with the exception of the lock **control** circuit of current sensing door locks, shall be those specified for overvoltage (or, in Canada, China and the USA, overload) in 17.2.*

*The current for the **control** circuit of current sensitive door locks shall be that declared in Table 1.*

17.7.3 *Replacement:*

*The method of **operation** and the **operating sequence** shall be as declared by the manufacturer.*

17.7.7 *Replacement:*

*During the test, the **locking** means of the door lock shall be in its operating position.*

NOTE In Canada and the USA, the number of cycles is 50.

17.8 Test of automatic action at accelerated rate

Replacement:

17.8.1 *The electrical conditions for all automatically operated circuits, with the exception of the lock **control** circuit of current sensing door locks, shall be those specified in 17.2. The current for the **control** circuit of current sensing door locks shall be that specified in 17.2.*

17.8.2 *The thermal conditions shall be those specified in 17.3.*

17.8.3 *The method of **operation** and the **operating sequence** shall be as declared by the manufacturer.*

17.8.4 *The number of automatic cycles for the test is that declared in Table 1, requirement 27, less the number of cycles specified in 17.7.*

17.9 Test of automatic action at slow rate

Not applicable.

17.10 Overvoltage (or overload test in Canada USA and 17.10 all countries that use the overload test) of manual action at accelerated speed

17.10.3 *Replacement:*

*The method of **operation** and the **operating sequence** shall be as declared by the manufacturer.*

17.10.4 *Replacement:*

The number of manual cycles is either 10 % of the number declared in Table 1 or 100 cycles, whichever is the smaller.

NOTE In Canada and the USA, the number of cycles is 50.

17.11 Test of manual action at slow speed

Replacement:

17.11.1 *The electrical conditions for manually operated circuits shall be those specified in 17.2.*

17.11.2 *The thermal conditions shall be those specified in 17.3.*

17.11.3 *The method of **operation** and the **operating sequence** shall be as declared by the manufacturer.*

17.11.4 *The number of manual cycles is that declared in Table 1, requirement 26, less the number of cycles specified in 17.10.*

17.12 Test of manual action at high speed

Not applicable.

17.13 Test of manual action at accelerated speed

Not applicable.

18 Mechanical strength

This clause of Part 1 is applicable except as follows:

Additional subclauses:

18.101 Locking tests

One sample shall be used for the tests of 18.101.1 and 18.101.2.

18.101.1 Locking force

*Upon completion of the **locking** process, the declared **locking force** shall be applied, without jerks, on the **locking** means for 1 min.*

After this test, there shall be no evidence of mechanical damage to the door lock. The door lock shall continue to operate as intended and shall comply with the requirements of Clauses 8 and 20.

18.101.2 Locking security

*After the tests of 18.101.1, the **locking force** shall be increased at an even rate and without jerks until unlocking occurs.*

After this test, the door lock shall comply with the requirements of Clauses 8 and 20.

In addition, for door locks classified under 6.4.101, the outputs shall be as declared in Table 1, requirement 105.

19 Threaded parts and connections

This clause of Part 1 is applicable.

20 Creepage distances, clearances and distances through solid insulation

This clause of Part 1 is applicable.

21 Resistance to heat, fire and tracking

This clause of Part 1 is applicable.

22 Resistance to corrosion

This clause of Part 1 is applicable.

23 Electromagnetic compatibility (EMC) requirements – Emission

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable.

25 Normal operation

This clause of Part 1 is applicable.

26 Electromagnetic compatibility (EMC) requirements – Immunity

This clause of Part 1 is applicable. See also Annex H.

27 Abnormal operation

This clause of Part 1 is applicable except as follows:

27.2.3 Blocked mechanical output test (abnormal temperature test)

Modification of the first paragraph and the following subclauses:

Electrically operated door locks with motors shall withstand the effects of blocked output without exceeding the temperatures indicated in Table 26. Temperatures are measured by the method specified in 14.7.1. This test is not conducted on **electrically operated door locks** with motors where, when tested under blocked output conditions for 7 h, any protective device, if provided, does not cycle under stalled conditions, and which do not exceed temperature limits in Table 13.

27.2.3.1 ***Electrically operated door locks*** *with motors are tested for 24 h with the output blocked at rated voltage and in a room temperature in the range of 15 °C to 30 °C, the resulting measured temperature being corrected to a 25 °C reference value.*

NOTE In Canada and the USA, the test is conducted at the voltages indicated in 17.2.3.1 and 17.2.3.2.

27.2.3.3 During the test, power shall be continually supplied to the door lock.

27.2.3.4 Immediately upon completion of the test, the door lock shall be capable of withstanding the electric strength test specified in Clause 13, without first applying the humidity treatment of 12.2.

27.5 Not applicable.

Additional subclauses:

27.101 Test with disconnected phase on three phase electrically operated door locks with motors

27.101.1 *With any one phase disconnected, the* ***electrically operated door lock*** *with motors is operated under normal* ***operation*** *and supplied at rated voltage. For asymmetrical motor windings, the test is to be repeated until all phases have been singly opened.*

27.101.1.1 *The test duration shall be such that the first and second hour winding temperatures are recorded or until temperatures stabilize, whichever is longer. Temperatures are measured by the method specified in 14.7.1.*

27.101.1.2 *The temperature of the winding shall not exceed the temperatures indicated in Table 26.*

27.102 Running overload test

27.102.1 A running overload test is carried out on **electrically operated door locks** with motors that are intended to be remotely or automatically controlled or liable to be operated continuously in unattended mode. If present, overload protective devices relying on electronic circuits to protect the motor windings, are also subjected to the running overload test.

27.102.2 The door lock is operated under normal operating condition, carrying its rated load and supplied at rated voltage until the temperature of the motor windings stabilizes. The protector or protective method shall not operate or open the circuit while the door lock is operating under the above conditions.

27.102.2.1 For all **electrically operated door locks** with motors where the maximum trip point in the sensing variable is not known or cannot be quickly determined (for example, temperature sensing method, impedance protected motors, sensor-less motor protection methods, position sensing, etc.), the load to the door lock is increased in increments of 10 % of the rated value (torque, current, etc.) and operated until temperatures of the winding stabilize. If the protector or the protective circuit does not function under this overload condition, the load to the door lock is again increased by 10 % of the previous load **setting** and the door lock is operated until temperatures of the windings stabilize. This process is continued until the protective device or protective circuit operates.

When the protector or protective circuit operates, the load is slowly decreased until the protector or protective circuit is not activated. The door lock is then run at this maximum load until the temperature of the winding stabilizes.

Any mechanical protection such as a **clutch** shall be defeated for this test.

27.102.2.2 For **electrically operated door locks** with motors where the maximum trip point in the sensing variable is known or can be quickly determined (for example, current sensing methods), the load to the door lock is gradually increased, in a controlled manner, until the protective device or protective circuit is activated. This is the load cut-off point and the loading parameters (torque, current, etc.) shall be measured and recorded. Then, the load is decreased slowly from the load cut-off point until the protector or protective circuit is not activated. The door lock is then run at this maximum load until the temperature of the winding stabilizes.

NOTE A brake dynamometer may be used to gradually increase the torque on the door lock shaft in a controlled manner.

27.102.3 During the test, the maximum winding temperature prior to the functioning of the protective device or protective circuit shall not exceed:

– 140 °C, for class 105 (A) winding insulation;

– 155 °C, for class 120 (E) winding insulation;

– 165 °C, for class 130 (B) winding insulation;

– 180 °C, for class 155 (F) winding insulation;

– 200 °C, for class 180 (H) winding insulation;

– 220 °C, for class 200 (N) winding insulation;

– 240 °C, for class 220 (R) winding insulation;

– 270 °C, for class 250 winding insulation.

NOTE If the load cannot be increased in appropriate steps, the motor and the protective electronics, if applicable, may be removed from the door lock assembly and tested separately.

27.102.3.1 During the test, the **maximum temperature** recorded on insulating parts that directly supports the motor shall not exceed 1,5 times the relevant values specified in Clause 14.

28 Guidance on the use of electronic disconnection

This clause of Part 1 is applicable.

Annexes

The annexes of Part 1 are applicable except as follows:

Annex H
(normative)

Requirements for electronic controls

This annex of Part 1 is applicable except as follows:

H.2 Terms and definitions

Additional definitions:

H.2.101.1
permanent operation
continuous monitoring of the protective function during the **operation** of the appliance or **system** for longer than 24 h

Note 1 to entry: 24 h is considered the typical time period for **fault** assessment.

H.2.101.2
non-permanent operation
continuous monitoring of the protective function during the **operation** of the appliance or **system** for less than 24 h

Note 1 to entry: 24 h is considered the typical time period for **fault** assessment.

H.6 Classification

H.6.18 According to classes of control functions

H.6.18.2 *Addition:*

H.6.18.2.101 Door locks with Type 2.AA action intended to prevent a hazardous condition according to H.2.22.2 are classified as having **class B control functions** or **class C control functions**.

H.6.18.3 *Addition:*

H.6.18.3.101 Door locks with Type 2.AA action that are used on self-cleaning ovens intended to prevent a hazardous condition according to H.2.22.3 are classified as having **class C control functions**.

H.7 Information

Additional requirements to Table 1:

Information	Clause or subclause	Method
107 Frequency of the **defined state** test function	H.27.1.2.2.2 H.27.1.2.3.2 H.27.1.2.3.3	X
108 The **control** is for **permanent operation** or **non-permanent operation**	H.2.101.1 H.2.101.2 H.27.1.2.2.2 H.27.1.2.3.2	X

H.11 Constructional requirements

H.11.12 Controls using software

H.11.12.2.6 *Replacement:*

NOTE The values declared in Table 1, requirement 71 may be given in the applicable appliance standard.

H.11.12.2.7 *Addition:*

NOTE 101 The values declared in Table 1 requirement 72 may be given in the applicable appliance standard.

H.23.1.2 Radio frequency emission

Addition:

Integrated and **incorporated controls** are not subjected to the tests of H.23.1.2, as the results of these tests are influenced by the incorporation of the **control** into the equipment and the use of measures to **control** emissions used therein. These tests may, however, be carried out under declared conditions if so requested by the manufacturer.

H.26 Electromagnetic compatibility (EMC) requirements – Immunity

H.26.1 *Addition:*

Additionally, for Type 1.AA or 2.AA door locks, the ability of the door lock to physically secure a door, cover or lid shall remain unaffected after each test. Auxiliary circuits and electronic outputs shall comply with the requirements of H.26.15.

H.26.2 *Replacement (including H.26.2.1 and H.26.2.2):*

For door locks with Type 2, Type 1.AA or Type 2.AA action, compliance is checked by the tests of H.26.4 to H.26.14 inclusive. For Type 1 door locks other than Type 1.AA, compliance is checked by the tests of H.26.8 and H.26.9.

For integrated and incorporated door locks with Type 2, Type 1.AA and Type 2.AA action, with the exception of H.26.5, the applicable tests are optional and are only performed if declared by the manufacturer under Table 1, requirement 58a.

For integrated and incorporated Type 1 door locks other than Type 1.AA, compliance is checked by the tests of H.26.8 and H.26.9 if declared by the manufacturer under Table 1, requirement 58a.